

Ground-mounted Solar Calculations

Average household uses ~~900~~³⁰ kWh/day, ~~30~~⁹⁰⁰ kWh/month, 2000 square foot house (source: EPA).

Twenty 300 watt panels would offset this usage based on five peak sun hours/day. Each panel would produce 1.5 kilowatt-hours/day to offset energy usage. (Source: SolarReviews.com) (Editor's note: this is optimistic based on Chicago's latitude)

Size of a 60-cell panel is 66" x 40" or 2,640 square inches or 18.33 square feet. Twenty panels would be 366.66 square feet. Add rails assuming two high, ten across:

One horizontal rail - 2" x 40" x 10 panels = 800 square inches = 5.5 square feet

Nine vertical rails - 2" x 66" x 9 spaces = 1188 square inches = 8.25 square feet

Surround rail - 2" x 400" x 2 + 2" x 132" x 2 = 2128 square inches = 14.78 square feet

Total array size = 395 square feet

Chicago sunshine = 105 sunny days + 84 partly sunny days = 189 days or 51% sunshine. To compensate for cloudy days, panel size is doubled to 790 square feet.

Given that a lot with enough space to have ground-mounted solar would have a house of 3500 to 4000 square feet, the array would be doubled again to 1580 square feet.

In the proposed changes to the Village Code the array size is limited to 1200 square feet.

The EPA guidelines do not include electric vehicle charging. Sample battery sizes for plug-in hybrids:

Ford Escape - 14.4 kW	Volvo XC60 Recharge - 14.7 kW	Toyota RAV4 Prime - 18.1 kW
Lexus NX 350h - 18.0 kW	Hyundai Santa Fe - 13.8 kW	Audi Q5 - 17.9 kW
Kia Sorento 14.0 kW	Lincoln Corsair - 14.4 kW	

Recharging a plug-in hybrid would consume one-half of all solar energy produced in a day on average on a sunny day.

Sample battery sizes for battery-only EVs:

Tesla Model S - 95 kW	Kia EV6 - 77 kW	Ford Mustang Mach E - 70 kW
Volvo XC40 Recharge - 69 kW	Chevrolet Bolt EV - 66 kW	

Recharging a battery powered EV would consume all of the solar power produced on a sunny day. Twice as many panels (40 panels) would be required on average to charge up an electric car on a daily basis.

Notes:

Tilt angles for Chicago - Summer: 72° ; winter: 24° ; optimal: 42° . For a ground-mounted array, the footprint would look about like this.

Solar panels are becoming more efficient. At the present time efficiency is about 22%. In the future, fewer panels may be required to produce the same amount of electricity as today.

Inverters are becoming more efficient which means better conversion rates from DC to AC. It should be noted that today's inverters are already at 98% conversion efficiency in many cases.

